REMARKS

INTRODUCTION

Claims 1-13 were previously and are currently pending and under consideration.

Claims 1-13 are rejected.

Claims 1, 2, 4, 7-9, 12, and 13 are amended herein.

No new matter is being presented, and approval and entry are respectfully requested.

INTERVIEW

Applicant thanks the Examiner for granting the discretionary After-Final Interview of October 27, 2003. At the Interview, the Applicant emphasized that the prior art does not discuss or suggest using pre-instructed teaching models to determine an unknown three-dimensional orientation of a workpiece before it is picked up or grasped. Applicant explained the view that Werth is only cited for and is only relevant for its discussion of pattern matching. Applicant explained the view that Iida discusses determining the position of a workpiece before being picked up but only discusses determining an orientation of the workpiece after the workpiece has been grasped and moved to a fixed camera. As stated in the Examiner's Interview Summary, it was concluded that Suzuki does not discuss how to pick up a part and in particular how to determine the unknown three-dimensional orientation of a part before it is picked up.

Based on the Examiner's Supervisor's remark that this Amendment (if based on the issues discussed at the Interview) would raise new issues over the Final Office Action, it was agreed that Applicant would file an RCE. In view of the new issues being raised, any future Office Action should be Non-Final.

Applicant brought to the Examiner's attention a U.S. Patent - 5,446,835 - that corresponds to the machine-translated Japanese Publication 07-319525 which has been cited by the Examiner (Iida). Iida is discussed below with reference to the U.S. Patent 5,446,835.

REJECTIONS UNDER 35 USC § 112, SECOND PARAGRAPH

In the Office Action, at pages 3 and 4, claims 5-7 were rejected under 35 U.S.C. § 112, second paragraph, for the reasons set forth therein. The formality has been corrected. According to the Examiner's comments, the formal correction does not narrow the scope of the interpretation of claims and 5-7, which were interpreted as having the now-corrected image pickup device rather than image pickup means. Furthermore, the amendment to claim 2 does not narrow the image pickup feature. Withdrawal of the rejection is respectfully requested.

REJECTIONS UNDER 35 USC § 103

In the Office Action, at pages 4-7, claims 1-6 and 8 were rejected under 35 U.S.C. § 103 as obvious over Suzuki in view of Werth. Claim 7 was rejected as obvious over Suzuki and Werth in view of Ninomiya. Claims 9-13 were rejected as obvious over Suzuki and Werth in view of Iida. These rejections are traversed and reconsideration is requested.

Claims 1 and 2, as amended, recites "an image processing system with which a current three-dimensional orientation of the subject object relative to an image pickup device is recognized". Claim 8 recites "determining a current three-dimensional orientation of a subject object relative to an image pickup device". Claims 9 and 12 recite "determining the orientation of the workpiece relative to the image pickup device on the robot based on the relative orientation information associated with the matched stored image". Claim 13 recites "determining a current workpiece-camera orientation by matching one of the images or data thereof with the current image, and using predetermined subject-camera arrangement information of the matched image to determine the orientation of the workpiece relative to the camera".

An aspect of the presently claimed invention discussed at the Interview relates to determining a relative orientation of a workpiece before it is picked up. Suzuki is silent on how to determine this relative orientation before pickup. The rejection acknowledges this at item 24, which also suggests pre-orientation of the parts before pickup is one of many possible ways to solve the problem of knowing the orientation of a part before picking it up. Iida has only been cited as providing parts that are unoriented before being picked up. Furthermore, in Iida the relative orientation of a workpiece is unknown upon or before pickup. The robot hand is only positioned (not oriented) to a holdpoint such as a hole in a workpiece.

The robot picks up the workpiece, and then maneuvers to the fixed camera 11 for an image (col. 12, lines 13-52). After pickup, the image is then used to two-dimensionally rotate the already-acquired workpiece according to the collation models (col. 12, lines 53-64). Therefore, Iida does not discuss determining relative orientation of a workpiece before it is contacted by or picked up by the robot.

Somewhat related is the feature of determining the relative pre-pickup orientation using predetermined relative orientation/direction information associated with corresponding images. As discussed at the Interview, the images captured in Suzuki are only used to determine the construction of Suzuki. The rejection refers to col. 4, lines 25-39 of Suzuki as discussing the inclusion of image pickup data (image data) in the teaching model. The rejection also compares the teaching model to the construction data memory 21. However, as shown in Suzuki's Figure 4, the construction data memory 21 stores position and orientation information of the parts relative to the sample 10. In other words, the position and orientation information of Suzuki is only in the three-dimensional coordinate system or space of the sample. Although images of the sample 10 are taken from different directions (col. 4, lines 7-9), they are then synthesized into edge information that is unrelated to the image capture directions (col. 4, lines 10-15). The edges are used to match to the predetermined part form data to determine the arrangements of the various parts relative to the sample. This information is then used for task planning.

It is also submitted that none of the prior art references discuss an image pickup device fixed to a *movable and positionable* part of the robot or [which] is grasped with a hand of the robot" (e.g. claim 1). Although the CCD cameras of Suzuki move about an axis (i.e. rotate) their position does not change. The camera of Iida is in a fixed location apart from the machinery (see Fig. 1, item 10).

Finally it is noted that none of the prior art references, and in particular Iida, discuss determining the *three-dimensional* relative orientation of a workpiece before it is picked up. In Iida, as discussed above, the orientation is unknown at pickup, and the workpiece is later rotated two-dimensionally about an axis according to collation information. The collation information is two-dimensional. In Suzuki, only the position of the part is discussed.

DEPENDENT CLAIMS

The dependent claims are deemed patentable due at least to their dependence from allowable independent claims. These claims are also patentable due to their recitation of independently distinguishing features. For example, claim 10 recites "automatically maneuvering the robot to the workpiece based at least on the determined orientation of the workpiece relative to the robot". This feature is not taught or suggested by the prior art. As discussed above and agreed at the Interview, the only orientation information in Suzuki is the orientation of a part within or relative to the sample of which it is a part. Withdrawal of the rejection of the dependent claims is respectfully requested.

CONCLUSION

There being no further outstanding objections or rejections, it is submitted that the application is in condition for allowance. An early action to that effect is courteously solicited.

Finally, if there are any formal matters remaining after this response, the Examiner is requested to telephone the undersigned to attend to these matters.

If there are any additional fees associated with filing of this Amendment, please charge the same to our Deposit Account No. 19-3935.

Respectfully submitted,

STAAS & HALSEY LLP

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By: _____

James T. Strom
Registration No. 48,702

1201 New York Ave, N.W., Suite 700
Washington, D.C. 20005
Telephone: (202) 434-1500
Facsimile: (202) 434-1501